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APPLICATION OF ERTS-1 IMAGERY TO STATE-WIDE

LAND INFORMATION SYSTEM IN MINNESOTA

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ERTS IMAGE DESCRIPTOR FORM

(See Instructions on Back)

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INTRODUCTION

The Minnesota State Planning Agency (MSPA) and the University of Minnesota, Center for Urban and Regional Affairs (CURA) are cooperating to develop capabilities for using ERTS-1 imagery for updating and improving the land use, land cover, and resource condition information in the Minnesota Land Management Information System (MLMIS). The objectives of this project are:

- (1) To evaluate and define the utility of ERTS-1 imagery to provide information about the type and condition of surface cover resources.
- (2) To develop data extraction techniques that are transferable to user agencies and their field or regional research personnel.
- (3) To demonstrate the applications of ERTS-1 imagery in ongoing planning and research operations of the various resource management agencies in the state.
- (4) To transfer the capability for using remote sensing techniques to the state and regional agencies charged with planning, policy development, and management of land-based resources.

This report summarizes the progress from the January 1 through June 30, 1974 period. The bulk of activities have been directed toward satisfying objectives 1, 2, and 3.

WORK PROGRESS AND PROGRAMS FOR NEXT REPORTING INTERVAL

Three demonstration - quasi operational projects have been the focus of this reporting period and all will be completed by the end of Phase III on September 23, 1974. The Twin Cities Metropolitan Area land use map, the first of these projects to be initiated, is nearing completion of a revised final draft. The wildlife habitat and seasonal cultivation study is awaiting Minnesota Department of Natural Resources (MDNR) evaluations and analysis of the operator variance study. The third project, the State Water Mapping Program, was initiated during this reporting interval. Based on findings and techniques of other projects, this cooperative, CURA, MDNR and MSPA project was initiated to provide current information on the location, areal extent, and seasonal change in open water in two critical areas of Minnesota and may be further expanded to include the entire state. The status of each of these projects will be described separately.

Twin Cities Metropolitan Area Land Use with ERTS-1 Imagery

by Joseph Gibson, John Harrington, and Dwight Brown

The Twin Cities Metropolitan Area land use is being re-mapped at a scale of 1:125,000 on base maps provided by the Metropolitan Council in order to comply with their requests for base information on such things as park boundaries. The primary problem that has arisen has been the confusion between forested land and sparse residential development under a dense deciduous forest canopy. Mid summer imagery seems to be the most useful for differentiating most urban classes. October 6, 1972 imagery has been used to define the maximum extent of open water.

Completion of the evaluation and editing will be completed by August and the map, along with a full technical report, will be complete at the end of Phase III in September.

Wildlife Habitat Change and Seasonal Cultivation

by John Harrington, Joseph Gibson, and Dwight Brown

This project is directed toward evaluating the use of ERTS-1 imagery for analysis of seasonal change in wildlife habitat in agricultural areas of Minnesota. The project initially mapped the extent of removal of vegetation by cultivation for seven townships in West Central Minnesota for eight different time periods. The Minnesota Department of Natural Resources is cooperating in this project under the direction of Mr. Thomas Isley. However, the original seven townships lack any kind of ground truth and were all mapped by Harrington and Gibson. In order to better evaluate these products for MDNR purposes it was deemed necessary to conduct a test for both accuracy of interpretation and operator variance among interpreters with minimal experience. To do this four additional townships in South Central Minnesota were selected by MDNR and students in a remote sensing class provided the interpretation after two hours of instructions.

At the present time we are awaiting evaluation of the four townships tested by MDNR field personnel. Due to summer project commitments these results are not expected until August at which time the operator variance analysis can be carried out.

State Water Mapping Program

by John Smiley, Eliahu Stern, and Dwight Brown

The results of two projects in the Geography Department at the University of Minnesota and supported by a NASA grant to the University of Minnesota Space Science Center encouraged the development of a cooperative pilot project to update Minnesota surface water information using ERTS-1 imagery. Meetings with technical as well as administrative heads of each division in MDNR and various personnel from MSPA, CURA, the Minnesota Land Management Information System (MLMIS), Water Resources Research Center, Limnological Research Center, the Space Science Center and the Geography Department resulted in the establishment of a MDNR-MSPA-CURA cooperative project to map the location, areal extent, and seasonal change in open water.

MDNR, the dominant user agency gave two study areas highest priority. The first was the copper-nickel study area in Northeastern Minnesota. This area was selected because knowledge of the potentially affected drainage areas was not available and assessment of environmental impact is just beginning. These open water maps use existing 1:24,000 and 1:62,500 scale topographic maps as their base.

ERTS-1 imagery is used to validate the maximum water extent within the period of ERTS coverage. Frequently the maximum area covered by water is greater than the extent shown on quadrangles. New and seasonal water bodies not shown on the quadrangles also frequently appear on images if the area exceeds five acres.

The minimum extent of open water is also included at MDNR's request. Minimum water areas result from change in the alignment of scan lines with respect to strand lines, change in water levels, and probably most importantly the presence of emergent or floating vegetation.

The maps for the Copper-Nickel study area are complete and reduced versions of two quads are appended. Materials costs are about \$3.00 per quadrangle, including the color slide photos of two dates of ERTS-1 MSS color 9 1/2" positives for each quadrangle. Interpretation, mapping, and drafting of the final copy required an average of 6 hours for the 1:24,000 scale maps and almost double the time for 1:62,500 scale maps. These times are dependent on the number of lakes and will vary considerably for other areas of the state.

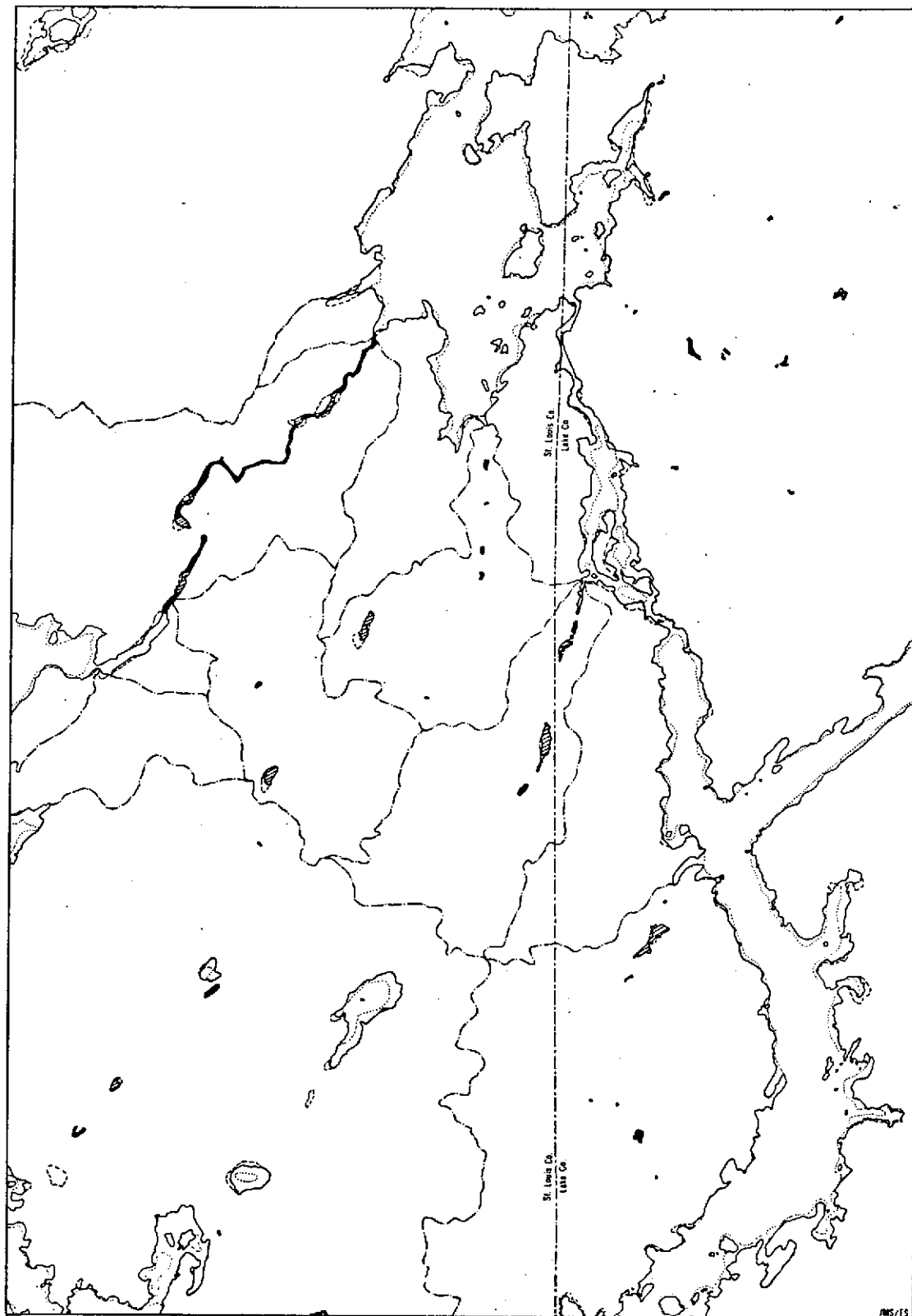
The second pilot project area is the Twin Cities Metropolitan area. Three quadrangles of the seven county area were completed by the Geography Department Project as a test to work out interpretation and mapping procedures. The remaining 42 quadrangles will be completed as part of this Pilot project during July.

A third pilot area has not been selected by MDNR, but will probably be a West Central Minnesota area that is a critical waterfowl producing area. These three areas should provide the appropriate time and cost frame for completing the remainder of the states 1740 quadrangles, which would provide the basis for location areas and change, data for a statewide water information system to be established by MDNR.

The final report under this contract will include a complete technical discussion of the procedures, and an evaluation of the results of the three pilot projects.

KANGAS BAY QUADRANGLE, NWIN.

CHANGES OF VISIBLE OPEN WATER

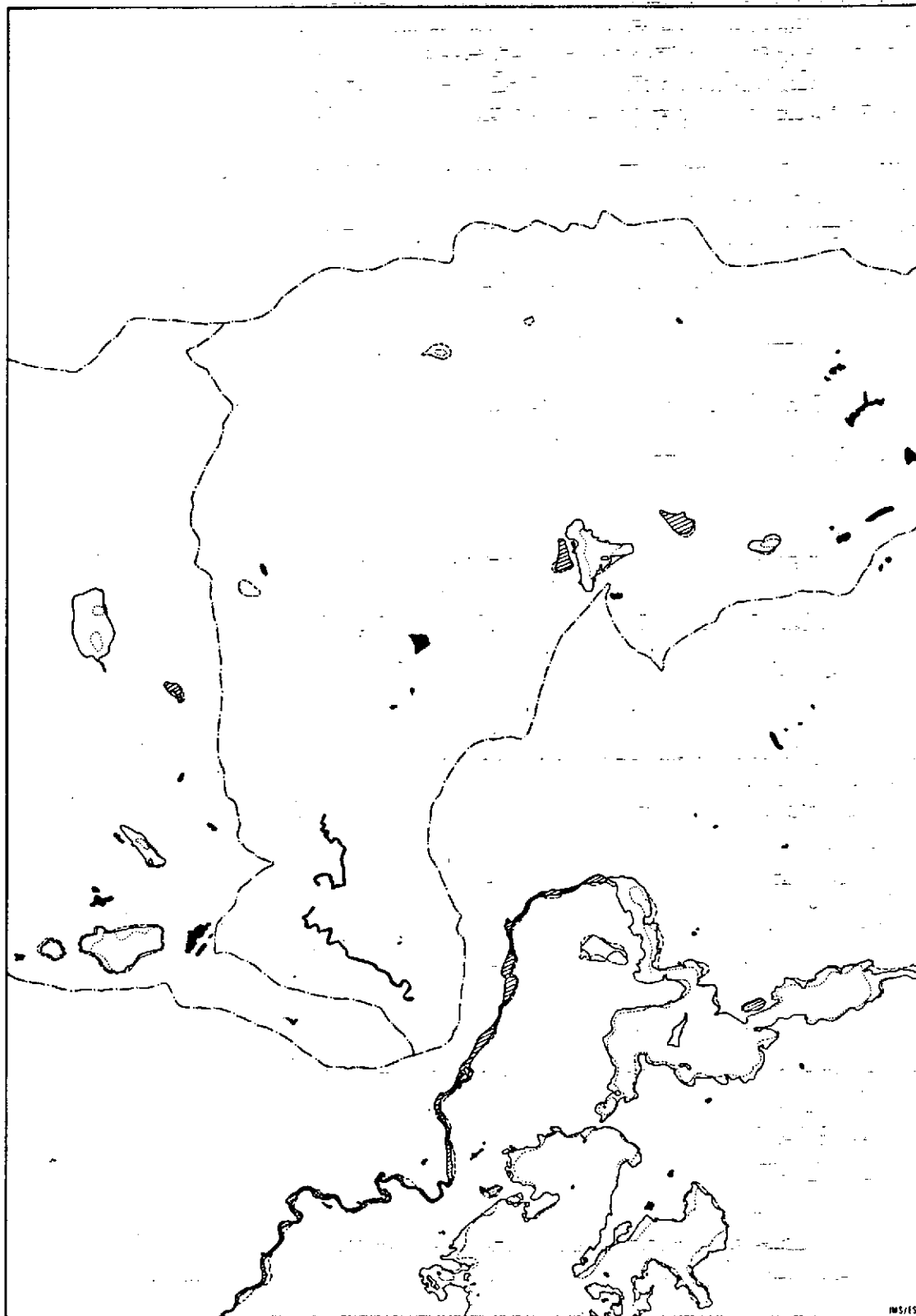


0 1 mile

- County boundary
- Watershed boundaries
- Lake boundaries
- 1972 U.S.G.S. Topographic Sheet
- Maximum visible change 5/28/73
- Minimum visible open water 7/21/73
- Undetectable but existent on U.S.G.S. sheet
- ▨ Detectable on 5/28/73 only

Source: ERIS Satellite photographs

AURORA QUADRANGLE, NENM.
CHANGES OF VISIBLE OPEN WATER



0 1 mile

- Undetectable but existent on USGS sheet
- Detectable on 5/23/73 only

- Watershed boundaries
- Lake boundaries
- 1972 USGS Topographic Sheet
- Maximum visible change 5/28/73
- Minimum visible open water 7/25/73

Source: ERTS Satellite photographs